An Integrated Genomics Framework for System-Level Cell Factory Design

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Abstract

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We combine barcoded mutagenesis and molecular biosensors to study the genetic and metabolic adaptation to the overexpression of enzymes for regenerating fundamental cellular biosynthetic precursors and co-factors such as NADPH and Malonyl-CoA. Our goal is to map bacterial response to metabolic engineering aimed at producing chemical compounds sustainably.

Directed evolution of living systems allows selection for improved biomolecules, but robust, stable and reliable systems are important, and particularly targeted and multiplexed insertion into the genome.

Forward genetic screens are ‘phenotype to genotype’ approaches that involve modulating the expression of many genes, selecting the cells or organisms with a phenotype of interest, and then characterizing the mutations that result in those phenotypic changes. We are using this approach to map cellular responses and the adaptation to strain engineering that will enable predictive strain optimization and refactoring.